REMARKS

Applicant has added new claims 27-37, which claim additional features of the invention. Claims 27-34 generally correspond to previously canceled claims 1-3, 5-9, and claims 35-37 claim additional aspects of the invention.

Applicant notes that the examiner indicated that claims 22 and 26 contained allowable subject matter. However, in view of the remarks below Applicant considers that all of the claims are allowable over the art cited.

The examiner rejected claims 10, 11, 14-17, 19-21 and 23 under 35 U.S.C. 102(b) as being anticipated by Matsuura.

Applicant's claim 10 is distinct over the reference. Claim 10 calls for a switching type DC/DC boost type converter that receives energy from a primary cell *** and is arranged to deliver the energy to a rechargeable cell *** and a circuit disposed to control the switching type DC/DC converter. Claim 10 features the circuit including a resistor voltage divider coupled to a feedback input of the converter, the resistor voltage divider having a resistance value selected to provide from the DC/DC converter a fixed output voltage that is less than the full charge voltage of the rechargeable cell.

The examiner considers that Col. 4 lines 50-52 teaches the DC/DC converter coupled to the primary cell or another current limited power source and "unit 30, FB" teaching the circuit to provide less than full charge voltage limitation. *(See office action page2).*

Matsuura's unit 30 is the DC/DC converter. Unit 30 includes an input "FB." However, Matsuura does not teach that the switching type DC/DC boost type converter receives energy from a primary cell. Rather, Matsuura teaches that the DC/DC converter receives energy from an AC adapter. At col. 4 lines 55-65 Matsuura describes:

> The DC/DC converter 30 serves as a DC power feeding circuit for converting a DC current and a DC voltage fed from, e.g., the AC adapter to a preselected voltage and a preselected current, respectively. For example, the converter 30 may advantageously be implemented by one capable of lowering a DC voltage of about 16 V input via the AC adapter to a voltage

> between 12.5 V to 13.0 V. In the illustrative embodiment, the converter 30 has a feedback terminal PB to which voltages are fed back from the voltage control circuit 34 and current limiting circuit 36. The converter 30 is therefore capable of adjusting its output voltage and output current in accordance with the above feedback voltages.

Failing to teach a DC/DC converter to deliver energy from a primary cell and to deliver the energy to a rechargeable cell, clearly shows that Matsuura would miss the motivation to modify its teachings and charge the secondary cell at less than its full charge voltage. That is, Matsuura neither describes nor suggests charging the secondary battery at less than its full charge voltage. At Col. 5 lines 28-36 Matsuura clearly teaches to charge at or above the full charge voltage.

> The voltage control circuit 34 is a voltage setting circuit for controlling the output voltage of the DC/DC converter 30 to a preselected voltage. In the illustrative embodiment, the circuit 34 is capable of controlling the converter output voltage to either one of a first and a second voltage. The second voltage is lower than the overcharge voltage of the secondary battery, but higher than the full charge voltage of the same, e.g., 12.76 V. The first voltage is lower than the second voltage and corresponds to the full charge voltage of the secondary battery, e.g., 12.6 V.

One learns from Matsuura that the voltage control circuit 34 provides a charging voltage that is either a first voltage or second voltage. However, the range of the first and second voltages fall in a range of being lower than the overcharge voltage of the secondary battery, but at or higher than the full charge voltage of the secondary battery. That is, Matsuura teaches to provide output voltages that fall between the full charge voltage and the overcharge voltage. Matsuura does not suggest to provide the resistor voltage divider having a resistance value selected to provide from the DC/DC converter a fixed output voltage that is less than the full charge voltage of the rechargeable cell.

These teachings clearly show that the DC/DC converter in Matsuura is for use with an AC charger, and that the two voltages of the DC/DC converter are either at, or higher than the

full charge voltage of the secondary cell. In Matsuura, a protective switching circuit 12 is provided for preventing the battery body 10 from being overcharged or undercharged. (col. 4 lines 6-10).

However, Applicant recognizes at page 2 lines 1-13 that:

> The circuit can take advantage of charging voltage characteristics of Li- ion or Li- polymer rechargeable batteries. For example, the charge voltage of Li- ion batteries is conveniently related to their state of charge over a wide range. This allows the circuit to produce an output voltage from the DC/DC converter 12 at a level that corresponds to a desired state of charge. The circuit does not fully charge the rechargeable battery, sacrificing a percentage of the maximum continuous runtime of the device. But, the non-fully charged arrangement provides the following advantages. The circuit provides a higher energy efficiency of the rechargeable battery. At the end of charge of a rechargeable battery heat losses are produced. By avoiding maximum charge such losses are avoided. Also the rechargeable battery has a lower self-discharge rate (because of a lower charging voltage). In addition, there is minimization in damage from long-term storage. If the rechargeable battery is stored at full charge, the Li- ion battery will permanently lose part of its capacity. Also the circuit minimizes the need for a charge controller and protection circuit.

Matsuura does not disclose an arrangement that provides a fixed output voltage that is less than the full charge voltage of the rechargeable cell and hence cannot posses these advantages. Therefore, Matsuura does not disclose every feature of the claimed invention and thus claim 10 is allowable.

Claim 11 calls for a primary battery current sensor/comparator, included in a feedback control loop of the DC/DC converter that controls in part operation of the converter to provide constant current discharge on the primary battery side of the hybrid power supply. This feature is not disclosed by Matsuura.

Claim 14 recites that the switching type DC/DC boost type converter delivers an output voltage that corresponds to about 90% charge of the rechargeable cell. This feature is not disclosed by Matsuura. Matsuura as pointed out above does not teach to recharge a cell to less

than full charging voltage and inherently does not teach that the switching type DC/DC boost type converter provides an output voltage that corresponds to about 90% of the voltage of the rechargeable cell.

Claim 15 distinguishes over Matsuura since the reference neither describes nor suggests delivering energy from a primary cell to a rechargeable cell *** through a switching type DC/DC boost type converter at a fixed voltage that is less than the full charge voltage of the rechargeable cell.

Claims 16-17 and 19, which depend on claim 15 are allowable for reasons discussed above in claim 15 and also add additional distinct limitations. For instance, claim 19 calls for the circuit to deliver an output voltage that corresponds to about 90% charge of the rechargeable cell. This is not suggested by the references.

Claim 20 distinguishes for similar reasons, and also since the reference does not describe *** an operational amplifier with a primary battery current sensing resistor to provide primary battery current control with the output of the amplifier coupled in a closed feedback loop of the DC/DC converter and the closed feedback loop of the converter further comprises a resistor coupled between output and feedback terminals of the converter.

Claims 21-26 add additional distinctive limitations and are also allowable.

Applicant has added new claims 27-34 (generally corresponding to previously canceled claims 1-3, 5-9) that were previously rejected over Matsuura and Park. Claim 27 is distinct over Matsuura and Park for similar reasons as discussed above. The references do not suggest a switching type DC/DC boost type converter that receives energy from a primary battery cell and is arranged to deliver the energy to a rechargeable cell, the DC/DC converter having a feedback input set to provide a fixed output voltage that is less than the full charge voltage of the rechargeable cell and a pair of external resistors coupled to the feedback input of the converter to adjust the fixed output voltage to be less than the full charge voltage of the rechargeable cell. Claims 28-34 add additional patentably distinct limitations.

Newly added claims 35-37 are also allowable. Claim 35 includes the limitations of a primary cell *** or another current limited power source and a rechargeable cell ***. Claim 35

also includes a switching type DC/DC boost type converter that receives energy from the primary cell and is arranged to deliver the energy to the rechargeable cell. Claim 35 includes a circuit *** to provide from the DC/DC converter a fixed output voltage that is less than the full charge voltage of the rechargeable cell. This charges the rechargeable cell to less that its full charge capacity. These features are not disclosed by the reference. Early allowance is respectfully requested.

A check in the amount of $86.00 is enclosed. Please apply any charges or credits to deposit account 06-1050.

Respectfully submitted,

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